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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/782,471      | 02/12/2001  | Miguel A. Jimarez    | END919980110US3     | 6225             |

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EXAMINER

BEREZNY, NEMA O

| ART UNIT | PAPER NUMBER |
|----------|--------------|
|----------|--------------|

2813

DATE MAILED: 08/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application N .

09/782,471

Applicant(s)

JIMAREZ ET AL.

Examiner

Nema O Berezny

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 25 April 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-41 is/are pending in the application.
- 4a) Of the above claim(s) 19-39 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-18,40 and 41 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 February 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Response to Arguments***

In view of the Appeal Brief filed on 4-25-03, PROSECUTION IS HEREBY REOPENED. An office action is set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

- (1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,
- (2) request reinstatement of the appeal.

If reinstatement of the appeal is requested, such request must be accompanied by a supplemental appeal brief, but no new amendments, affidavits (37 CFR 1.130, 1.131 or 1.132) or other evidence are permitted. See 37 CFR 1.193(b)(2).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-6, 9-11, 13-14, 16-18, and 40-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Somaki et al. (5,641,113) in view of Akamatsu et al. (5,611,481). Somaki discloses an electrical structure, comprising: a first substrate

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comprising a chip (Figs.2A-3 el.11; col.4 lines 4-5); a first conductive body and a third conductive body, each comprising a solder bump (el.13a; col.5 lines 1-2) coupled to said first substrate; an epoxy material (el.14; col.5 lines 15-21) that volumetrically surrounds and contacts a first portion of a surface of said first and third conductive bodies such that a second portion of the surface of said first and third conductive bodies is not contacted by said epoxy material, and wherein said epoxy material is continuous between said first and third conductive bodies (Figs.2C,2D); a second conductive body mechanically and electrically (el.13b) coupled to said first conductive body by surface adhesion at said second portion; a fourth conductive body (el.13b) mechanically and electrically coupled to said third conductive body by surface adhesion at said second portion; and a second substrate comprising a circuit card (el.20; col.6 lines 59-61) coupled to said second and fourth conductive bodies; wherein a height of said second conductive body is at least 50% of a height of said solder bump (Fig.2E; col.4 lines 44-50; col.5 lines 57-67), and wherein a height of said second conductive body is at least 3 mils (col.6 lines 31-34). Somaki also discloses an epoxy material (el.34) applied to the second layer of conductive bodies (col.5 lines 38-42; col.8 lines 15-17); therefore, it would have been obvious to a person skilled in the art at the time of the invention to encapsulate the top layer of conductive bodies in order to completely protect the device from moisture, chemical corrosion, and mechanical stress. Somaki also discloses that said epoxy material is rigid at the melting point of the first and third conductive bodies (col.6 lines 34-41).

Somaki specifically discloses an area of said first portion exceeding an area of said second portion by a factor of over 5 (col.5 lines 3-4, 48-51). Somaki also discloses that said areas of covered and exposed regions is a tradeoff between the area of the electrodes and the volume of the solder balls (col.9 lines 38-50). Therefore, it would have been obvious and within reasonable experimentation for a person skilled in the art at the time of the invention to adjust the volume and the exposed circular area of the solder balls to meet specific product demands. For example, Somaki discloses an exposed area diameter of 0.63 mm and a sphere diameter of 0.8 mm (col.5 lines 3-4, 48-51), which results in a ratio of covered area to exposed area of approximately 5.5. If the exposed diameter was changed to 0.6 mm and the sphere volume was changed to 1.0 mm, said ratio would be 10.1. If the exposed diameter was changed to 0.5 and the sphere volume was changed to 0.9, said ratio would be 12.0.

However, Somaki does not disclose a second conductive body whose melting point is less than a melting point of said first conductive body. Akamatsu discloses a flip chip device wherein the chip is coupled to the substrate using two stacked layers of conductive bodies wherein the melting point of one conductive body exceeds the melting point of a second conductive body by no more than about 147 degrees C (col.4 lines 4-16). Akamatsu also discloses a eutectic lead/tin ratio conductive body and a lead/tin ratio conductive body that exceeds a eutectic lead/tin ratio (col.4 lines 4-16), and a ceramic substrate (col.5 lines 25-31). Therefore, it would have been obvious to a person skilled in the art at the time of the invention to use the conductive bodies of different melting points of Akamatsu such as eutectic and non-eutectic conductive

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bodies, and the ceramic substrate of Akamatsu with the electrical structure of Somaki in order to avoid repellency of molten soldering metal by the electrode surface and thereby reduce electric resistance and increase mechanical strength of the connection (Akamatsu – col.3 line 48 - col.4 line 27), and to utilize a thermally conductive substrate, respectively.

Claims 7-8, 12, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Somaki in view of Akamatsu as applied to claims 1-6, 9-11, and 13-14 above, and further in view of Thomas (6,213,347). Somaki in view of Akamatsu do not disclose an encapsulating material which includes epoxy anhydride with silica filler, an organic substrate, or a cured light-sensitive resin material. Thomas discloses a flip chip device which comprises an encapsulating material between the chip and attached substrate, which includes epoxy anhydride with silica filler and cured by light irradiation (col.5 lines 62-67; col.6 lines 23-28; col.7 lines 1-3; col.8 line 65 – col.8 line 3). Thomas also discloses an organic substrate (col.5 lines 62-67). Therefore, it would have been obvious to a person skilled in the art at the time of the invention to use the encapsulant and organic substrate of Thomas with the electronic structure of Somaki and Akamatsu in order to distribute and absorb stress caused by the different CTE's of the different materials in the structure (Thomas – col.7 lines 28-35). A light cured resin avoids the need to heat the entire package in order to cure the resin.

***Response to Arguments***

Applicant's arguments with respect to claims 1-18 have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

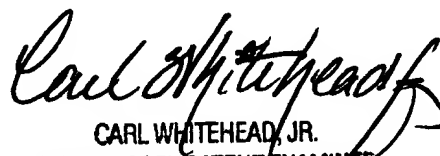
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nema O Berezny whose telephone number is (703) 305-3445. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead can be reached on (703) 308-4940. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

NB

July 28, 2003

  
CARL WHITEHEAD, JR.  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800